



Research Article

EFFECT OF TOTAL MIXED RATION (TMR) ON THE PERFORMANCE OF GROWING CROSSBRED KIDS

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Abstract: The present investigation was carried out to study the effect of feeding total mixed ration (TMR) on the growth performance of growing crossbred kids. Sixteen crossbred (Beetal x Assam Local) weaned kids at 4 months of age was divided into two groups with average equal body weight and number of male and female kids were also kept equal in each group. The control group (C) was provided with concentrate ration (19.62% CP & 73.55% TDN) and chopped roughages (mixture of Para grass-*Brachiaria mutica* and Napier grass-*Pennisetum purpureum*) separately and the treatment group (T) was provided with total mixed ration (TMR) prepared with 1/3rd concentrate ration and 2/3rd roughages on dry matter (DM) basis. The animals were fed *ad libitum* twice daily and standard management and housing was provided in both the groups. The average body weight of kids at 7th months of age was 12.15±0.46 and 13.79±0.18 kg in C and T groups, respectively. There was highly ($p<0.01$) significant effect of feeding TMR on body weight. The daily body weight gain from 4th -7th month of age also differed significantly ($p<0.01$) between C (0.060±0.021 kg) and T (0.077±0.044 kg) groups. The average height at withers (45.10±2.53 vs 50.10±0.64 cm) and body length (44.48±2.07 vs. 48.69±0.66 cm) differed significantly ($p<0.05$) between C and T groups, respectively at 7th month of age. There was highly significant ($p<0.01$) effect of treatment on the average chest girth (46.40±2.11cm vs. 50.54±0.39 cm) at 7th month. There was highly significant ($p<0.01$) effect of TMR feeding on the average daily feed intake during the 4th -7th month of age (0.40±0.020 kg vs. 0.44±0.05 kg) and significant ($p<0.05$) on feed conversion ratio (FCR) between C (6.93±1.42) and T (5.95±0.96). The digestibility coefficient of dry matter (DM) and other organic matters except ether extract (EE) was significantly ($p<0.01$) more in TMR than the control group. The average cost of feeding per kg body weight gain was ₹ 92.79 and ₹ 77.96 in C and T groups, respectively. The present investigation revealed that feeding of TMR significantly increased body weight and body weight gain in crossbred kids with reduced cost of feeding per kg body weight gain. Therefore, fattening of kids can be done more effectively through TMR feeding practice instead of separate feeding in crossbred goat.

Keywords: TMR feeding, Kid, Body weight, Body measurement, Feeding cost

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Introduction

The goat (*Capra hircus*) is one of the earliest domesticated species of livestock associated with mankind since time immemorial. Goat plays a significant role for empowerment of women and for household nutritional security amongst the rural poor people. Due to its great potential in socio-economic development, the goat had been given privileged name by Father of Nation, Mahatma Gandhi as "poor man's cows". In spite of regular slaughter of about 45 percent goat annually, its population has increased at the rate of about 1.23 percent every year since last two decades. The goat population was 124.36 million during 2003 and 148.88 million during 2019. The goat contributes 3.0 percent to the total milk production and 13.35 percent to the total meat production including poultry meat in India [1]. The per capita meat consumption in India is around 5.2 kg annually, which is far below the ICMR recommendation of 11.0 kg per year. Improved feeding practices for fattening goat would be no doubt a significant tool to augment meat (chevon) production. Out of various feeding practices, TMR is mostly popular in dairy cattle, but in goat it has not been extensively used. The TMR is a complete feed in respect of its all nutrients and fibre content. It is advantageous for ruminant species due to uniform release of ammonia which avoid alteration in rumen pH, and subsequently utilized by microbes and improved in the dry matter (DM) intake [2]. To accelerate the growth of meat goat high quality grains or concentrate feed is necessary. But excess or *ad libitum* feeding of concentrate ration leads to bloat and acidosis. As the TMR is complete ration with sufficient fibre, it prevents occurrence of such problems even though after *ad libitum* or excessive feeding. In view of the very scanty report, the present investigation was carried out to study the effect of TMR feeding on the growth performance, dry matter intake (DMI),

digestibility of nutrients and cost of feeding crossbred kids under stall feeding condition.

Materials and method

Sixteen crossbred (Beetal X Assam Local) weaned kids of average four months of age were selected from Goat Research Station, Assam Agricultural University, Bynihat. Experimental kids were weighed and marked with different identification numbers with non-toxic plastic collar tags. The male kids were castrated by closed method before the experiment. The kids were randomly assigned to two experimental groups of 8 kids in each viz., Control (C) and Treatment (T) maintaining average equal body weight and uniform sex. The animals in C-group were provided daily feeds separately at different time and T-group was provided with total mixed ration (TMR) *ad libitum* twice daily as per NRC (2001) [3]. The TMR was prepared by mixing 2/3rd chopped dry roughages consist of 50:50 Para (*Brachiaria mutica*) and Napier (*Pennisetum purpureum*) grasses and 1/3rd concentrate ration (CP-19.62% & TDN-73.55%). The concentrate feed was prepared by mixing of crushed maize, wheat bran, rice polish, ground nut cake (GNC), mineral mixture and common salt @ 40, 12, 10, 35, 2 and 1 percent, respectively. Before starting the experiment, a conditioning period of 7 days was maintained for adjustment of feeding practice and new experimental shed. During the conditioning period, all the experimental animals were weighed and examination of their physical condition was carried out and healthy animals were selected. Thereafter, all the experimental kids were dewormed to control parasitic infestation before the onset of the experiment.

Vaccination was also carried out as per the farm schedule. Experimental kids were let loose in an open paddock for free exercise after each feeding. The experimental kids were housed in elevated slatted wooden floor shed which had provision of natural cross ventilation. Each kid had been tied with a rope near an individual feeding trough to ensure individual feeding. Other standard management practices and hygienic protocol was followed for rearing the experimental animals. Different parameters studied for the experiment were, body weight, body weight gain, body measurements (body length, height and chest girth), dry matter intake (DMI), digestibility of nutrients and cost of feeding to fulfil the objectives. The statistical analysis was done as per the standard methods of Snedecor and Cochran (1994) [4].

Results and discussion

Body weight

The average body weight of crossbred kids at 4th months of age in control (C) and treatment (T) groups was 7.09 ± 0.67 and 7.29 ± 0.30 kg, respectively. The body weight at 7th months of age was 12.15 ± 0.46 and 13.79 ± 0.18 kg in C and T groups, respectively. The analysis of variance (ANOVA) revealed that there was highly significant ($P < 0.01$) effect of TMR on body weight. Das (2003) [14] reported that the average body weight of Assam local kids at 3rd-4th months of age was 6.56 ± 0.24 kg. Kalita (2003) [5] reported that the average body weight of Assam local kids at 3rd-4th months of age was 6.48 ± 0.52 , 6.56 ± 0.25 and 6.62 ± 0.32 , in different groups, respectively. Hwangbo *et al.* (2009) [6] found that average body weight of Korean Black Goats was 18.08 and 32.09 kg at 6 and 11 months of age, respectively. Kishore *et al.* (2017) [7] reported 25-30 kg finishing body weight of lambs at 6 months of age on TMR feeding. Doley *et al.*, (2018) [8] reported that the average body weight of Assam Hill goat and their crossbred (Beetal x Assam Hill goat) at 6 months of age was 8.75 ± 0.15 and 14.28 ± 0.25 kg, respectively. Sarma *et al.*, (2019) [9] reported that the average body weight of Assam Hill goat at 3 months of age was 4.590 ± 0.083 kg. The variation in body weight amongst the previous workers and the present study might be due to the factors like genetic makeup, time, place and management practices. The increase in body weight up to 4th fortnight of post weaning did not exhibit any significant difference between the two experimental groups. It might be due to adaptation period of TMR feeding up to 4th fortnight. However, in the 5th and 6th fortnight, the average body weight in T group was significantly higher than C group. Xu *et al.* (2017) [10] observed that the body weight of Tibetan sheep was better on TMR feeding (49.25 ± 1.29 kg) than the separate oats hay feeding group (38.08 ± 1.40 kg) at 14 months of age, which was differed significantly ($P < 0.01$). Keeping similarity with this author, in the present experiment also the average body weight of growing kids on TMR feeding was significantly better than the separate feeding group.

The crossbred kids maintained on TMR showed significantly higher body weight than those kids fed by conventional methods due to higher digestibility and feed conversion ratio. The steady state of rumen environment is conducive to continuous rumen function and digesta flow was facilitated by TMR feeding.

Body weight gain

The average body weight gain of crossbred kids during the first fortnight (4.0 to 4.5 months of age) was 0.56 ± 0.09 and 0.70 ± 0.13 kg, which were increased to 1.20 ± 0.12 and 1.65 ± 0.10 kg during the 6th fortnight (6.5 to 7.0 months of age) in C and T groups, respectively. The daily body weight gain was found to be 0.040 ± 0.007 and 0.050 ± 0.009 kg at the first fortnight and 0.086 ± 0.009 and 0.118 ± 0.007 kg at the sixth fortnight in C and T groups, respectively. The overall daily body weight gain during the entire period (4th to 7th months of age) was 0.060 ± 0.021 and 0.077 ± 0.044 kg in C and T groups, respectively. The analysis of variance showed that there was highly significant ($P < 0.01$) effect of feeding TMR and age on the body weight gain. Moreover, it was observed that the increase in body weight gain up to 5th fortnight did not show any statistically significant difference between the experimental groups. However, the body weight gain at 6th fortnight and the overall body weight gain differed significantly. The body weight gain reported in the present study was higher than the report of Bhuyan *et al.*, (1996) [11], who found that daily body weight gain was 22 to 31 g in kids from 4 to 7 months of age. He also observed daily body weight gain as 52 to 61 g in another

lot of kids. Talukdar (1999) [12] reported that the daily average body weight gain was 47.70 and 21.20 g in individual and group feeding groups, respectively from 3rd to 6th months of age in crossbred kids. The daily body weight gain found in the present experiment was nearer to the report of Kalita (2003) [5] who observed 41.87 ± 0.40 , 35.60 ± 0.72 and 20.33 ± 0.39 g daily body weight gain in different groups of crossbred kids. Bezbaruah *et al.*, (2019) [13] found that the daily average body weight gain was 47.47 ± 1.48 , 42.41 ± 1.77 and 40.78 ± 2.95 g, respectively in different groups of crossbred (Beetal x Assam Local) goats. Das (2003) [14] reported that the mean daily gain in body weight was 32.97 ± 0.52 , 32.11 ± 0.79 and 28.31 ± 0.27 g in different groups, respectively in Assam local goats. Bhadane *et al.*, (2004) [15] reported higher average daily body weight gain i.e., 75.7 and 72.9 g in different groups than the present findings. Priya *et al.*, (2020a) [16] reported that the overall daily body weight gain was 63.75 ± 9.86 , 96.04 ± 9.86 and 70.72 ± 10.57 g in different groups, respectively. Dhore *et al.*, (2006) [17] reported that the average daily body weight gain was 44.37 and 68.73 g in different groups, respectively from 4th to 6th months of non-descript goat kids. Chopade *et al.*, (2010) [18] reported that average daily gain in weight was 63.97 and 71.18 g in different groups, respectively in non-descript local kids from 4 to 7 months of age. Rabidas (2017) [19] reported lower daily body weight gain (0.026 ± 0.01 , 0.029 ± 0.006 , 0.027 ± 0.002 and 0.03 ± 0.0001 kg, respectively in different groups from 3 months to 6 months of age than the present report. Much higher daily body weight gain (100 – 150 g) was observed by Kishore *et al.* (2017) in lambs feeding TMR based feed. Bezbaruah *et al.*, (2019) found that the average daily body weight gain was 47.47 ± 1.48 , 42.41 ± 1.77 and 40.78 ± 2.95 g, respectively in different groups of crossbred (Beetal x Assam local) goats.

It was confirmed from the above observation that TMR feeding group showed higher weight gain than conventional feeding system. This may be attributed to improvement of health status and digestibility of feeds of kids for feeding TMR.

Height at wither

The height at wither increased correspondingly as the age of kids was progressed. The average height at wither in C and T groups was 45.10 ± 2.53 and 49.26 ± 0.64 cm, respectively at 7th months of age. The analysis of variance indicated that there was highly significant ($P < 0.01$) effect of TMR and fortnight on the height at wither. The kids maintained on TMR feeding showed significantly higher height at 5th and 6th fortnight. Talukdar (1999) observed height at wither as 37.75 ± 0.84 , which was lower than the present study. But Mule *et al.* (2014) [20] reported higher average height at wither (55.15 ± 0.21 cm) in Osmanabadi goat at 4-6 months of age group. Gohain (2004) [21] claimed height at wither of Assam local kids as 41.36 ± 0.22 cm, which was nearer to the present findings. Shankhpal *et al.*, (2016) [22] reported that height of weaner Surti kids was numerically higher in TMR feeding kids. The height observed in his report was lower than the present study report (15.00 ± 0.58 , 16.67 ± 0.67 , 14.17 ± 1.19 and 16.33 ± 1.20 cm, respectively in different groups of kids). On the other hand, Malik *et al.* (2020) [23] found that the height at wither was better on pellet TMR feeding than the loose TMR in fattening goat. It was observed that the kids maintained on TMR feed diets significantly had higher height at wither than the conventional feeding group at 6th fortnight. The significantly higher average height at wither in T group was due to better skeletal growth of kids on feeding TMR ration.

Body length

The average body length at 7th month of age was observed to be 44.48 ± 2.07 and 48.69 ± 0.66 cm, in C and T groups, respectively and they differed significantly ($p < 0.01$). Talukdar (1999) reported that the average body length at about 3 and 6 months of age in was 37.90 ± 1.29 and 44.60 ± 1.76 cm, respectively. Gohain (2004) claimed the average body length of Assam local kids was 37.16 ± 0.16 cm, which was less than the present finding. Priya *et al.* (2020a) found average body length of weaned Beetal kids as 56.00 ± 3.05 , 53.13 ± 3.05 and 52.99 ± 3.27 cm in different groups, which were higher than the present investigation. The average body length reported by him was increased to 67.00 ± 2.84 , 66.50 ± 2.84 and 64.61 ± 3.04 cm after 4 months. The significantly higher body length in T group at 7th month of age was due to better effect of TMR feeding on skeletal growth. The TMR feeding might have balanced the mineral utilization.

Chest girth

The final chest girth at 7th month of age was observed to be 46.40±2.11 and 50.54±0.39 cm in C and T groups, respectively. The analysis of variance (ANOVA) confirmed that there was highly significant ($P<0.01$) difference of chest girth of kids due to fortnight as well as treatment. It has been found that the kids maintained on TMR feed diets showed significantly higher chest girth than the conventional feeding group at 6.5 and 7.0 months of age. Gohain (2004) claimed that at the age of 3 months the average chest girth was 43.35±0.14 cm and it was higher than the present investigation. The average chest girth of Assam local kids was 48.81±0.33 cm at 6 months of age. Sheetal (2016) [24] found average chest girth of Nagaland long haired goat as 38.066±0.639 cm at 3 months of age and at 6 months of age it was 42.072±0.211 cm. Sarma *et al.* (2019) found the average chest girth of Assam Hill goat as 40.741±0.115 cm at 3 months of age; which was almost similar with the present study. Priya *et al.*, (2020a) found higher chest girth than the present findings in weaned kids. The average chest girth was apparently higher in T group from 4.5 months of age onwards and it was significantly ($p<0.05$) higher at the 6.5 and 7.0 months of age, which might be due to improvement of nutrient utilization for TMR feeding.

Correlation coefficient

There was highly significant ($P<0.01$) correlation between the body weight and body measurements viz., height at wither, body length and chest girth. Highest correlation was found with the chest girth in C group and body length in T group. The correlation coefficient of body weight with body length was 0.94 in treatment group and with chest girth 0.86 in C group. Khan *et al.* (2006) [25] reported that the correlation of body weight with height at wither, body length and chest girth was 0.75, 0.49 and 0.64, respectively during 4-12 months of age. Bello and Adam (2012) [26] found that the correlation of chest girth and body weight was highest ($r=0.677$) in Savannah Brown goats. Sam *et al.* (2016) [27] found the correlation of body weight with height at wither, body length and chest girth as 0.57, 0.63 and 0.68. Keeping similarity with the present results, he reported significant correlation between body weight and body measurements. The present correlation of body weight with body measurement was higher than the previous workers. Moreover, the correlation was higher in T group than C group; which might be due to better growth of kids in T group.

Dry matter intake (DMI)

The average DMI from 6.5 to 7.0 months was 6.58±0.69 and 6.86±0.19 kg in C and T groups and average daily DMI was 0.47±0.05 and 0.49±0.03 kg in C and T groups, respectively. The overall daily DMI was 0.40±0.02 and 0.44±0.05 kg in C and T groups, respectively during the entire period (4.0 to 7.0 months). The analysis of variance revealed highly significant ($P<0.01$) effect of treatment and age on the DMI. The DMI in T group was significantly higher at all the fortnights. Das (2003) observed that average daily DMI per 100 kg body weight was 3.23±0.27, 3.12±0.08 and 2.87±0.20 kg in different groups of Assam local kids, respectively. Fernandez and Sanchez-Seiquer (2003) [28] reported that daily DMI was much higher (1456.46 g) in dairy goats than the present results. The feed intake in the present study was significantly higher in T group than the C group, it might be due to improved palatability in that group.

Chopade *et al.*, (2010) found that the average daily DMI was 702.28±48.46 and 680.10±49.41 g in different groups of non-descript local goats at 4 months of age. He observed higher DMI than the present findings. In conformity with the present findings, Xu *et al.* (2017) found that the average daily DMI was significantly higher in TMR (1.41±0.03) than oat based hay (1.31±0.03) and silage feeding (1.22±0.03) groups and Sarker *et al.* (2018a) [29] observed that average DMI was significantly higher in TMR block and TMR mash feeding than the conventional feeding in Red Chittagong cows. The significantly more DMI in T group might be due to higher palatability of TMR feed.

Feed conversion ratio (FCR)

The average feed conversion ratio of crossbred kids during 1st fortnight (4.0-4.5 months of age) was 8.00±1.64 and 7.48±1.88 for C and T groups, respectively and the corresponding values during 6th fortnight (6.5-7.0 months of age) was

5.48±1.06 and 4.15±0.28, respectively. The analysis of variance (ANOVA) witnessed that there was highly significant ($P<0.01$) effect of fortnight and significant ($P<0.05$) effect of TMR on the FCR. The overall FCR in TMR group (5.65±0.96) was significantly lower than the control group (6.66±1.42). It was observed that the kids maintained on TMR feeding showed lower feed conversion ratio. Talukdar (1999) reported higher value of FCR (11.59±1.08) than the present investigation. Rabidas (2017) also observe slightly higher FCR (9.72±0.03) than the present study.

The FCR (5.04±0.11) found by Bezbaruah *et al.* (2019) in Beetal x Assam Hill Goat was lower than the present one. Keeping conformity with the present findings, Xu (2017) reported that FCR of TMR feeding group (7.65±0.38) was significantly ($P<0.01$) lower than feeding oats hay (15.89±2.24) and oats silage (11.92±1.04) in Tibetan sheep. Malik *et al.* (2020) observed that average FCR was higher in conventional TMR (7.34) than pellet TMR (7.21) feeding of fattening goat. Priya *et al.* (2020b) [41] investigated that the average FCR was 8.80, 6.16 and 9.03 in conventional feeding group, hay based TMR and fresh fodder based TMR, respectively. Zhong *et al.* (2020) [30] found that average FCR of crossbred cows was significantly ($p<0.05$) higher in ground TMR than the pellet TMR. Significantly lower FCR in treatment group was because of maximum growth rate for feeding TMR as it facilitated better rumen digestion of feed.

Digestibility coefficient nutrients

Digestibility coefficient of dry matter (DM)

The average coefficient of digestibility of DM was 60.32±0.48 and 62.16±0.15 percent in C and T groups, respectively. The t-test showed highly significant difference ($P<0.01$) between the two groups. Das (2003) showed higher digestibility coefficient of DM in growing kids. The significantly higher digestibility in T group might be due to more efficient microbial digestion in the rumen as TMR facilitates a balance and stable rumen environment. Babu *et al.* (2014) [31] found less value of digestibility of DM (60.05 to 61.55 percent) than the present findings. Zhong *et al.* (2020) found that the average digestibility of ground TMR and pellet TMR was for DM was 65.67 and 73.37 per cent, respectively. Supporting the present results, Vaghamsashi and Pandya (2016) [32] found higher digestibility of DM for TMR feeding (58.80%) than the separate feeding (56.09%) in sheep.

Digestibility coefficient of crude protein (CP)

The average digestibility coefficient of CP in C and T groups was 72.28±0.48 and 75.81±0.54, respectively. The digestibility coefficient of CP in T group was significantly more than C group as was revealed by the t-test. Raghuvansi *et al.* (2007) [33] found that digestibility of CP was 65.00 and 41.30 percent in complete block feeding and grazing with supplementation respectively for sheep. The difference was statistically highly significant ($P<0.01$) supporting the present investigation. They reported that digestibility of CP was 65.98, 69.00 and 71.91 percent in different complete feeding groups of ram lambs.

The observation of previous authors was found to be less than the present findings. Lower average digestibility of CP for feeding TMR (60.31 to 62.51%) was observed by Reddy *et al.* (2016) [34] in buffalo bulls and Babu *et al.* (2013) [35] in lambs (65.98 to 71.91%). Chetan *et al.* (2017) [36] [observed higher average digestibility coefficient of CP (67%) in arhar straw based TMR feeding in cattle than other groups. In conformity with the present findings, Chetan *et al.* (2017) [36], Sarker *et al.* (2018a) and Sarker *et al.* (2018b) [37] observed higher digestibility coefficient of CP in cattle due to TMR feeding. The significantly improved digestibility coefficient in treatment group might be due to favourable rumen ecosystem rendered by TMR feeds and causing better microbial digestion.

Digestibility coefficient of ether extract (EE)

The digestibility coefficient of EE in C and T groups was 68.54±0.62 and 69.08±0.78 percent, respectively and the t-test witnessed non-significant difference ($P>0.05$) between the two groups. Babu *et al.* (2013) observed higher digestibility coefficient of EE (74.18 to 87.06%) in ram lambs than the present findings. Babu *et al.* (2014) reported marginally higher digestibility coefficient of EE (69.81±1.90 to 73.17±2.40%) in Nellore lambs of 3 months of age. In the same line of present result, Vaghamsashi and Pandya (2016) found non-significant

difference of digestibility of EE for TMR (70.63%) and separate feeding (70.50%) in sheep and Chetan *et al.* (2017) observed non-significant difference of the average digestibility coefficient of EE of wheat straw (68%) and arhar straw (69%) based TMR feeding in cattle. The apparently higher digestibility of EE in T group might be due to efficient utilization of fatty acid in more balanced rumen environment on feeding TMR.

Digestibility coefficient of crude fibre (CF)

The average digestibility coefficient of CF in crossbred kids was 55.24 ± 0.54 and 59.73 ± 0.36 percent in C and T groups, respectively. The average digestibility coefficient of CF in T group was significantly ($p < 0.01$) more than C group as was indicated by the t-test.

The digestibility coefficient of CF observed by previous workers (Das 2003 and Kalita 2003) were higher than the present findings. But, Babu *et al.* (2014) in Nellore lambs and Chetan *et al.* (2017) in cattle found less digestibility coefficient of CF than the present investigation. Vaghmagashi and Pandya (2016) informed that digestibility of CF was 67.01 ± 1.53 and 64.20 ± 1.87 for separate and TMR feeding groups in sheep, but the difference was non-significant. The significant difference in digestibility coefficient of CF in the present experiment might be due to complete balanced feeding of kids in the form TMR.

Digestibility coefficient of nitrogen free extract (NFE)

The average NFE digestibility coefficient of crossbred kids in C and T groups was 59.98 ± 0.58 and 62.38 ± 0.35 percent, respectively. The t-test showed highly significant difference ($P < 0.01$) between the two groups. Das (2003) found higher digestibility coefficient of NFE (67.97 to 73.75%) in different groups of Assam local kids than the present study. Devasena and Prasad (2014) [38] reported average digestibility coefficient of NFE was 74.2 per cent in adult goats. Bezbaruah (2019) stated that digestibility of NFE were 74.52 ± 0.55 , 73.19 ± 0.81 , 72.58 ± 0.30 percent, respectively in difference groups of crossbred kids (Beetal x Assam Hill goat). The better digestibility of NFE in TMR group in the present study indicated well-organized rumen microbial fermentation in the growing kids.

Digestibility coefficient of organic matter (OM)

The average digestibility coefficient of OM in C and T groups was 60.57 ± 0.85 and 67.02 ± 1.14 per cent, respectively. The t-test revealed highly significant difference ($P < 0.01$) between the two groups. Das (2003) observed that digestibility of OM as 72.71 ± 3.00 , 73.13 ± 1.35 and 64.63 ± 1.37 percent in Assam local goat. Raghuvansi *et al.* (2007) established that digestibility coefficient was better for complete feed block (64.1%) under stall feeding than that of separate feed feeding in grazing (44.9%) with supplementation. Babu *et al.*, (2014) said that the average digestibility of OM was 61.01 ± 1.60 , 63.56 ± 2.66 and 64.08 ± 2.13 percent respectively, in different groups of Nellore lambs. Vaghmagashi and Pandya (2016) asserted that average digestibility coefficient of OM was 61.69 ± 0.86 and 64.69 ± 1.00 percent on TMR and separate feeding, respectively in sheep. Bezbaruah *et al.* (2019) stated that the average digestibility of OM was 75.45 ± 1.46 , 75.23 ± 0.41 , 74.39 ± 0.03 in difference groups of crossbred kids (Beetal x Assam Hill goat). Sarker *et al.* (2018a) observed that average digestibility of OM was significantly higher in TMR block (66.58%) and TMR mash (65.11%) feeding than the conventional feeding (54.01%) in Red Chittagong cows. Sarker *et al.* (2018b) found that the average digestibility of OM for TMR in bull calves ranged from 61.7 to 70.1 per cent. In the present experiment, digestibility coefficient was significantly improved in TMR feeding than separate feeding of kids. The better digestibility of OM in the TMR group might be due to uniform feed supply round the clock that made the rumen environment favourable for microbial action.

Cost of feeding

The daily feed cost per kid was found to be Rs. 5.59 and 6.23 in C and T groups, respectively. The average cost of feeding per kg body weight gain was Rs. 92.79 and 77.96 in C and T groups, respectively. Though the daily feed cost per kid was higher in T group; the cost per kg body weight was lower. Radhakrishnan and Balakrishnan (2013) [39] and Rao *et al.* (2014) [40] reported less cost of feeding in kids and lambs, respectively than the present findings. However, Chetan *et al.*

(2017) and Bezbaruah *et al.*, (2019) reported comparable cost of feeding in cattle and goats, respectively. In spite of higher daily feed cost per kid in T group, the cost per kg body weight was lower because of better FCR and efficient feed utilization due to higher digestibility of TMR.

Conclusion

The crossbred kids maintained on TMR feed had significantly better growth rate, increased digestibility of nutrients, less FCR and lower cost of feeding per kg body weight gain than the kids maintained on conventional separate feeding practice. Therefore, it may be recommended that goat keepers under organized and field conditions should offer TMR instead of feeding grains and roughages separately.

Application of research: The TMR feeding in growing and fattening kids may be practiced as it can be fed *ad libitum* without any digestive problems and will increase production of chevon.

Research Category: Veterinary Science

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Breed name: Crossbred kids (Beetal x Assam Local goat)

Conflict of Interest: None declared

Ethical approval: Ethical approval taken from College of Veterinary Science, Khanapara, 781022, Assam Agricultural University, Jorhat, 785013, Assam, India Ethical Committee Approval Number: No770/GO/Re/S/03/CPCSEA/FVSc/AAU/IAEC/19-20/742 dated 23.12.2019.

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